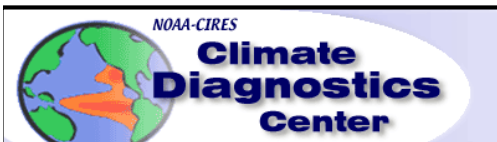


What can the Upper Colorado basin expect this winter?

Klaus Wolter

NOAA-Earth System Research Lab & University of Colorado at Boulder-CIRES

- **ENSO: current situation, typical impacts, and outlook**
- **What about the next two weeks?**
- **SWcasts for fall and winter**
- **A first stab at predicting Lees Ferry flow in 2010**
- **Summary**

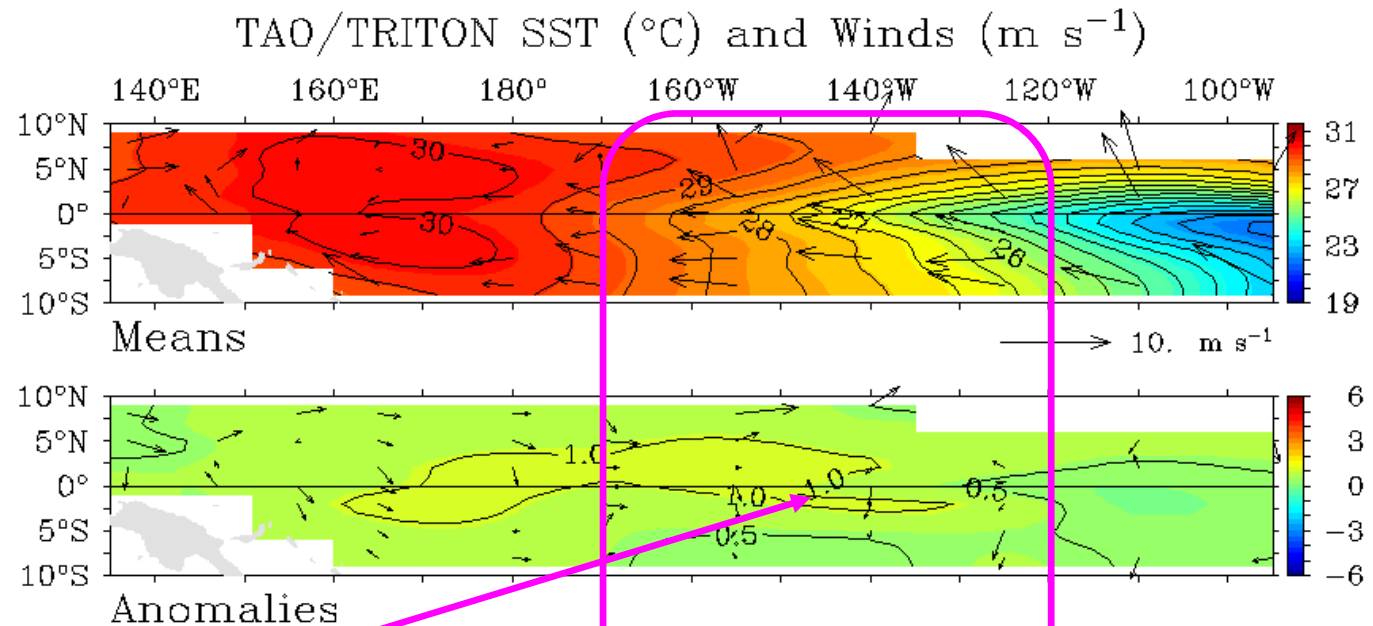


Colorado
University of Colorado at Boulder

Boulder/Salt Lake City 10nov09

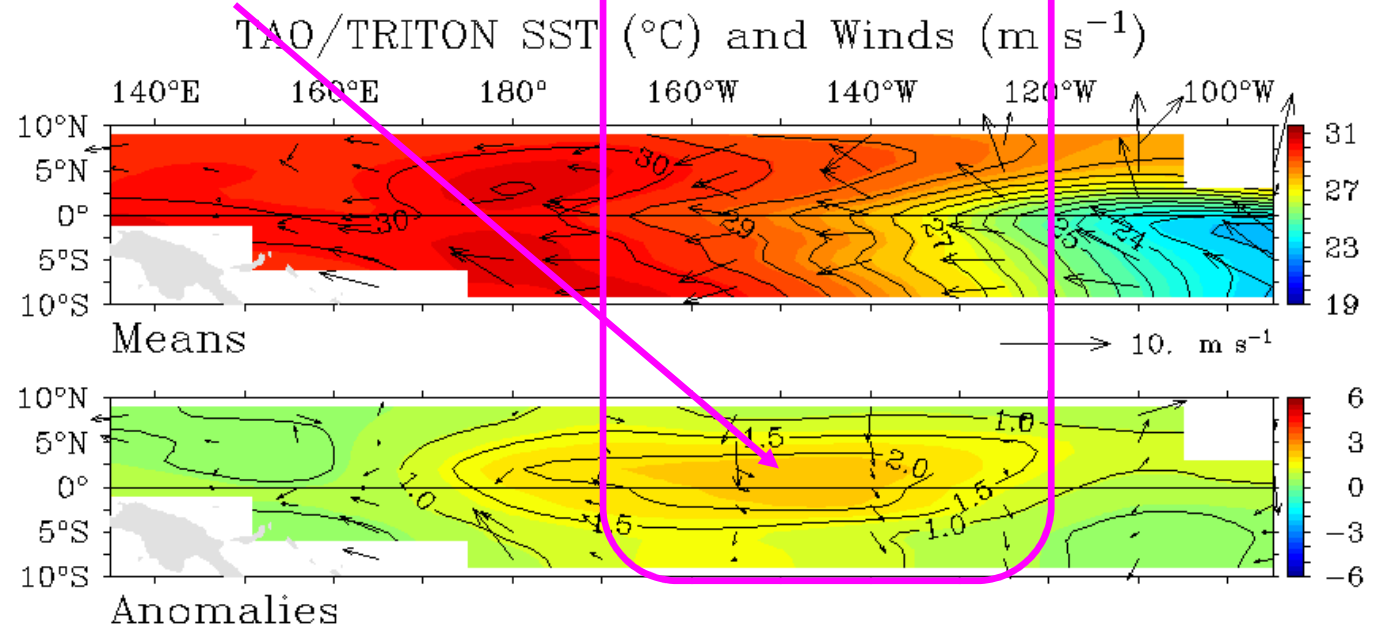


Current state of ENSO (bottom) compared to late-summer (top): after a long stretch of ‘life-support’ conditions (top), the last six weeks have seen a steady progression towards full-fledged, borderline strong El Niño conditions! This evolution appears to have leveled off, for now.



Five-Day Mean Ending on August 24 2009

Niño 3.4

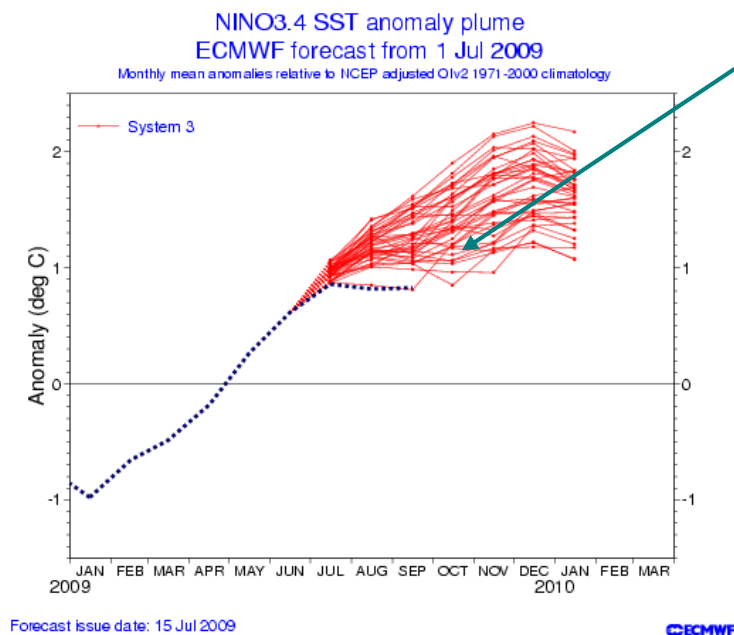
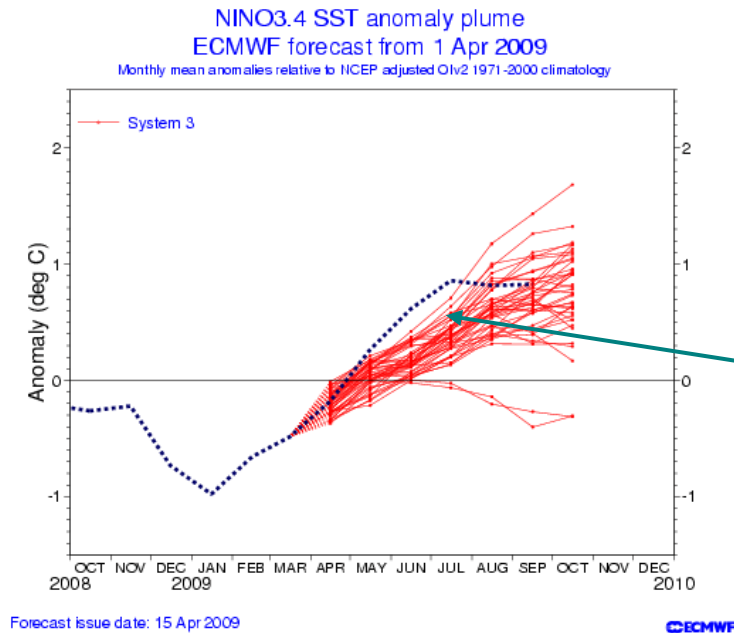


Five-Day Mean Ending on November 8 2009

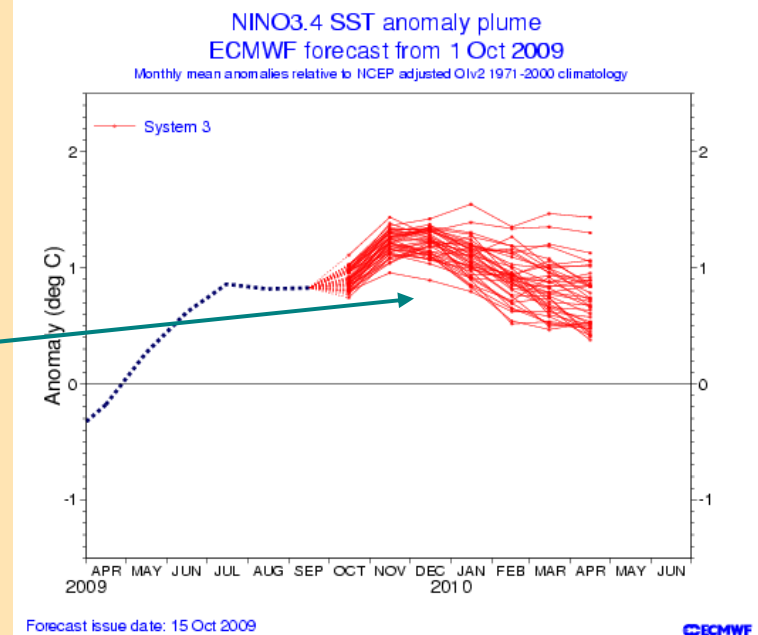
What's going on with ENSO?

The best performing coupled forecast model for 3-6 months out (Barnston, 2009): ECMWF April '09 forecast (left) anticipated El Niño conditions by July, not bad, but a bit too conservative;

Three months later, most models were too optimistic about the growth potential for Niño 3.4, including 49 out of 50 ensemble members of the ECMWF...

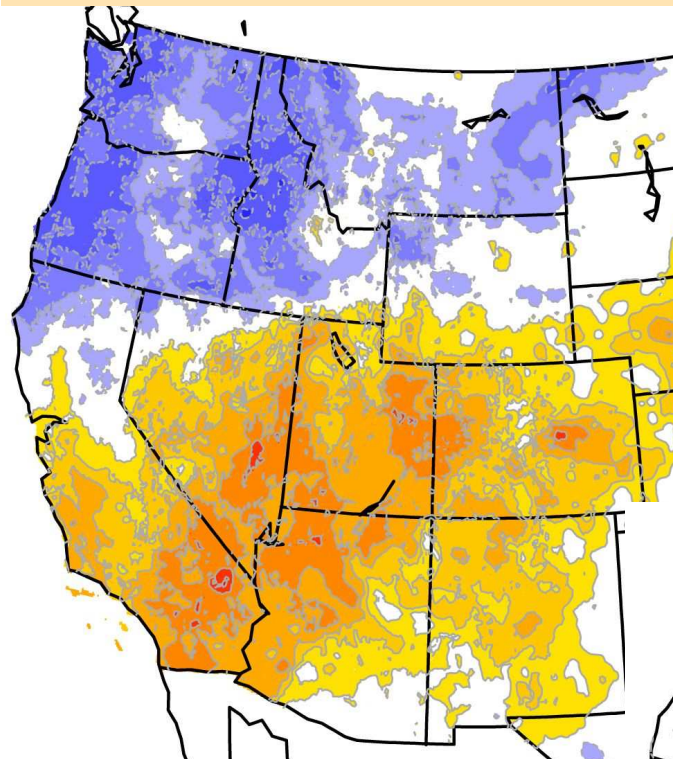


‘Chastened’ by recently stalled warming, the latest forecast maintains a moderate event into next year.



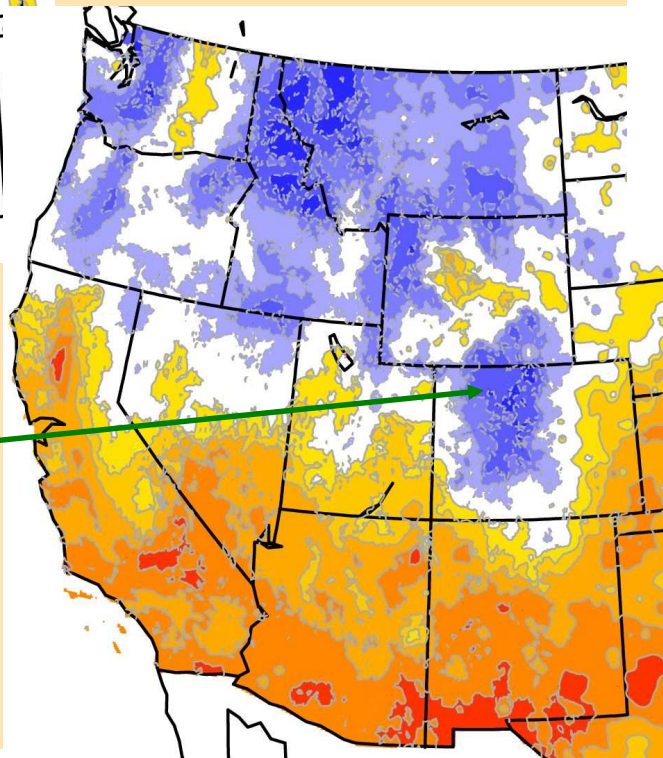
What are typical impacts in Western U.S.?

MEI vs. precipitation:
El Niño tends to be **wet** in **fall** and **spring** in UT and CO, but **dry** during mid-**winter**, especially at higher elevations!

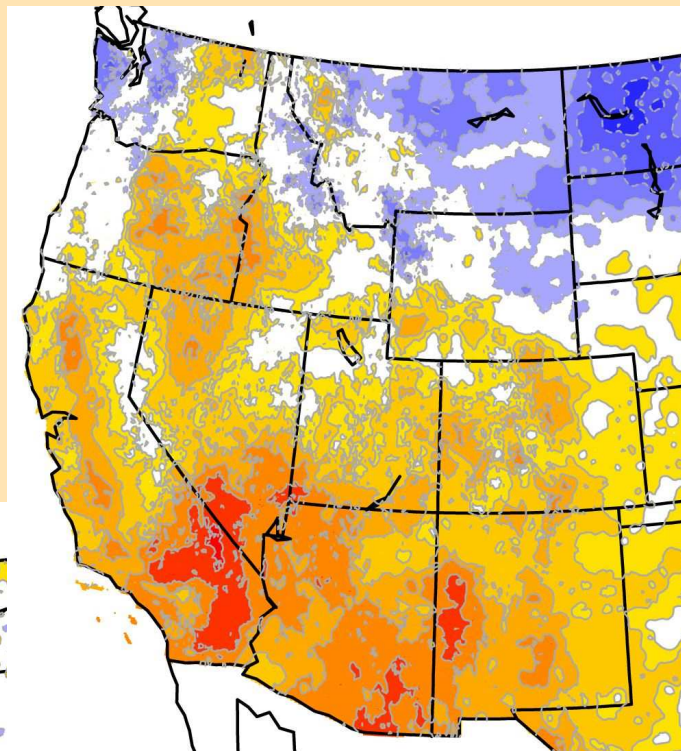


SEP-NOV

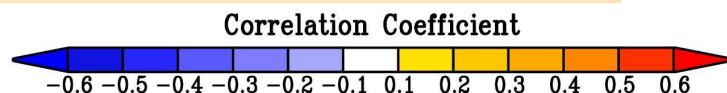
Upper Colorado basin prefers La Niña during winter!



DEC-FEB



MAR-MAY



Summary statistics on last decade of ENSO winters

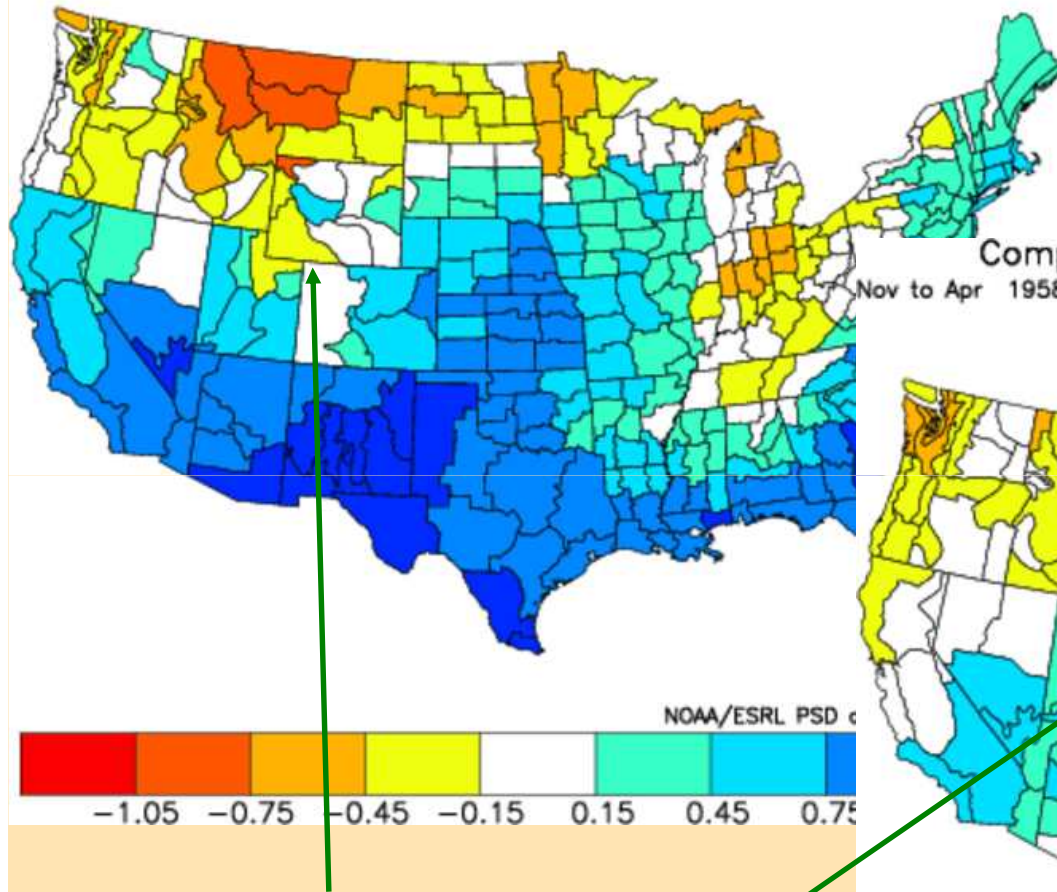
El Niños since 1999: *mixed* success with composites, 2004-05 matched ENSO expectations of ‘any flavor’, while both 2002-03 and **2006-07 did poorly** vs ‘weak’ event classification, somewhat better vs ‘strong’.

La Niñas since 1999: much better **success** in three out of four cases (2007-08 was an outlier on the WET side); *proper identification as ‘strong’ or ‘weak’ improved skill of composite-based forecast in every single case.*

Given the (more or less) negative phase of the PDO in the last decade, this is actually consistent with the role of the PDO (negative PDO interfering with El Niño!)

What are typical El Niño impacts in Western U.S.?

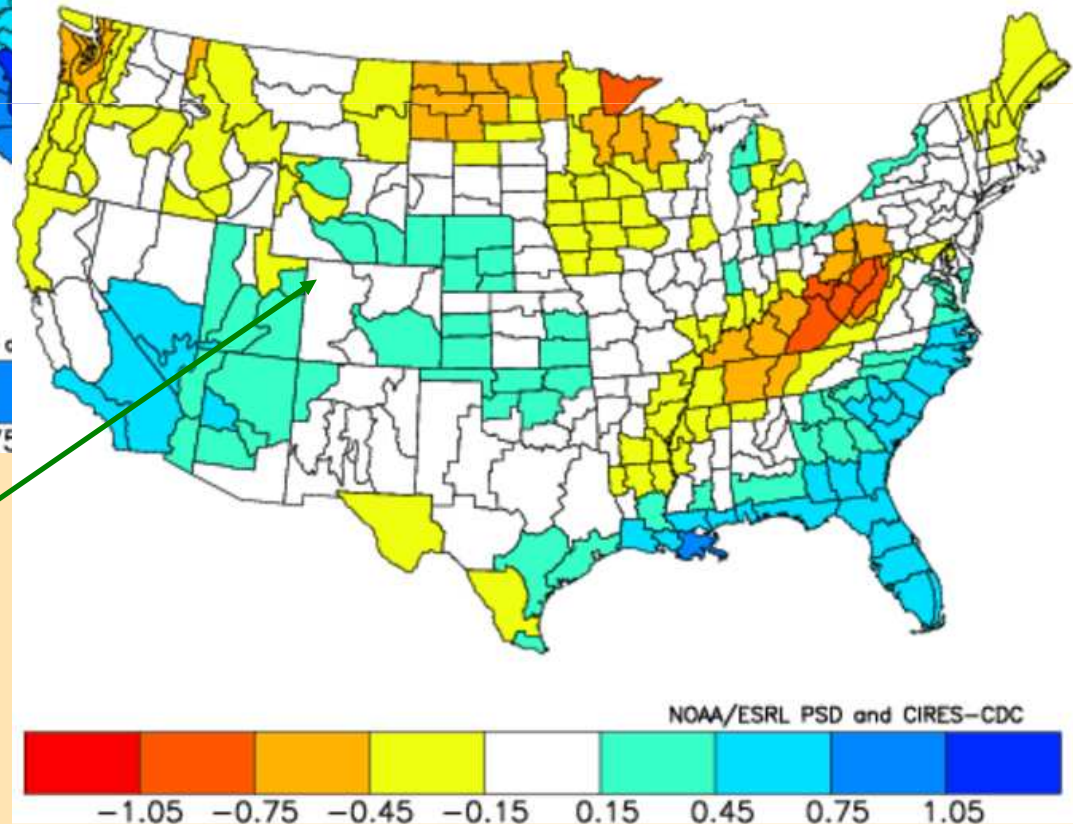
Composite Standardized Precipitation Anomalies
Nov to Apr 1957-58, 1965-66, 1972-73, 1982-83, 1986-87, 1991-92, 1994-95, 1997-98
Versus 1950-1995 Longterm Average



Upper Colorado basin
appears marginal at best!

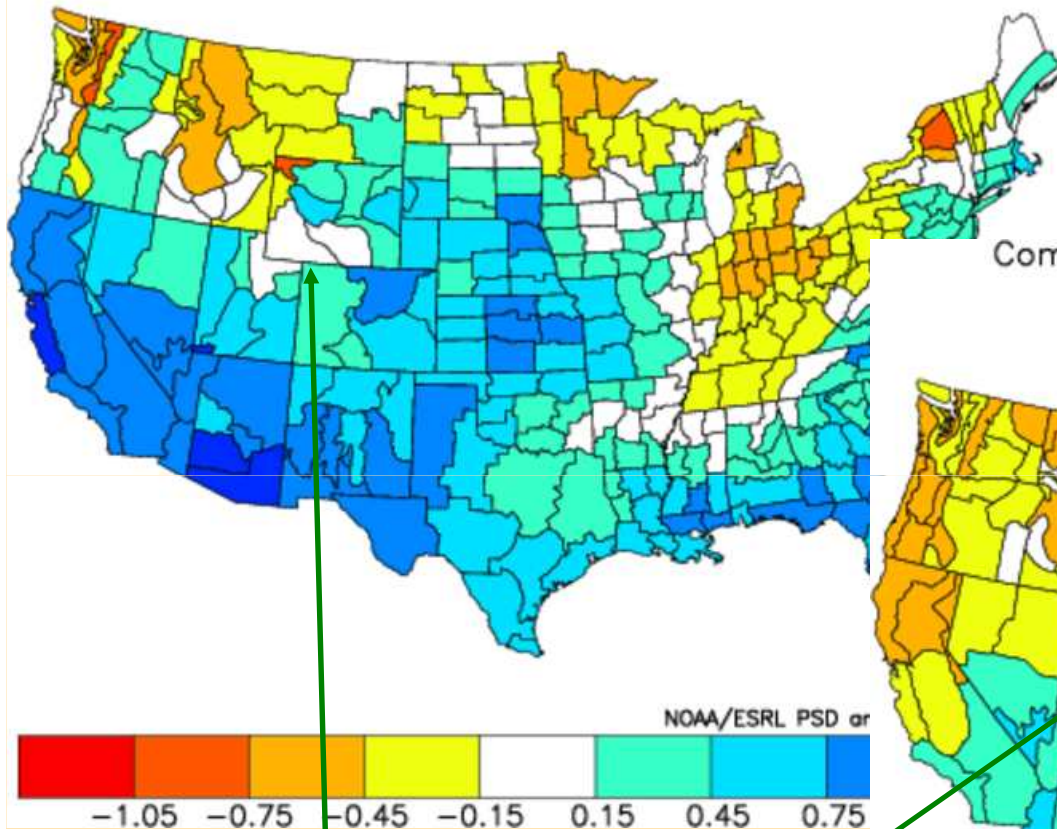
Nov-Apr Precipitation: Eight strong El Niño (**left**) vs. eight weaker El Niño cases (**bottom**) show better odds for moisture in most of the Southwest with stronger El Niños.

Composite Standardized Precipitation Anomalies
Nov to Apr 1958-59, 1963-64, 1968-69, 1976-77, 1977-78, 1979-80, 1987-88, 1992-93
Versus 1950-1995 Longterm Average



What are typical impacts in Western U.S.?

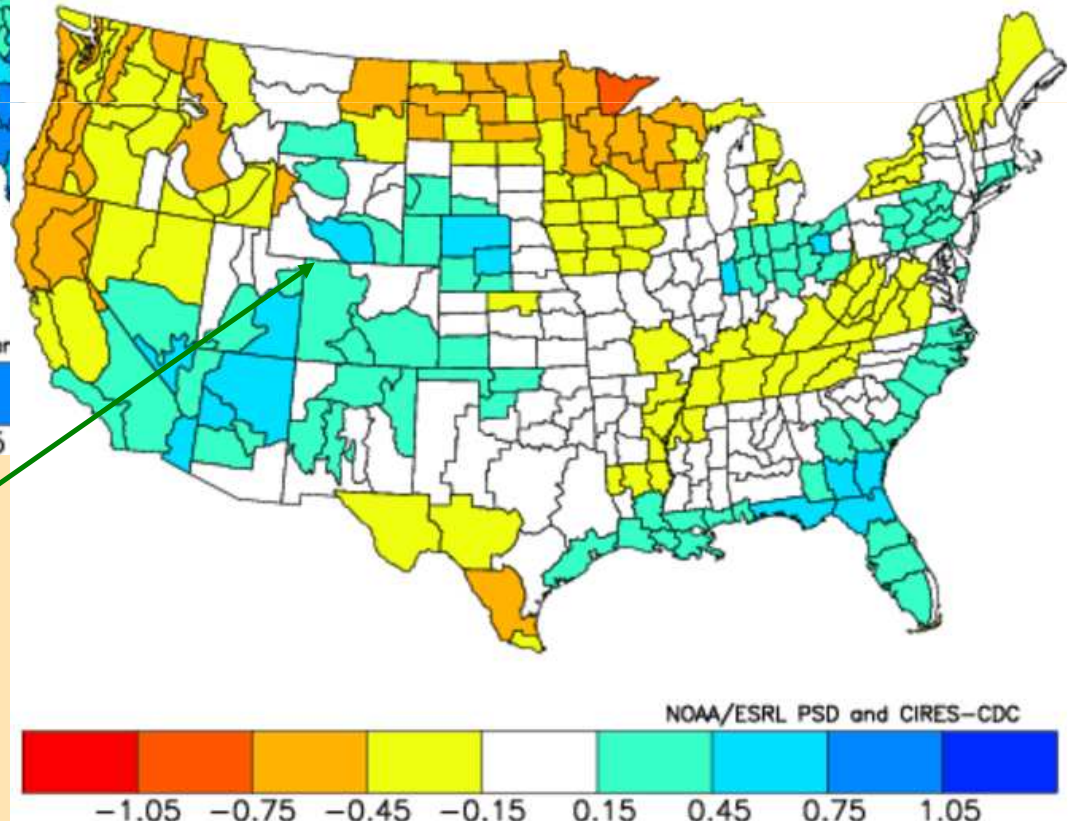
Composite Standardized Precipitation Anomalies
Feb to Apr 1958, 1966, 1973, 1983, 1987, 1992, 1995, 1998
Versus 1950–1995 Longterm Average



Upper Colorado basin
slightly improved!

Feb-Apr Precipitation: Eight strong El Niño (**left**) vs. eight weaker El Niño cases (**bottom**) continue this preferential response to strong events into late winter/early spring.

Composite Standardized Precipitation Anomalies
Feb to Apr 1959, 1964, 1970, 1977, 1978, 1980, 1988, 1993
Versus 1950–1995 Longterm Average



Colorado River El Niño Basin winters&springs

Upper Basin

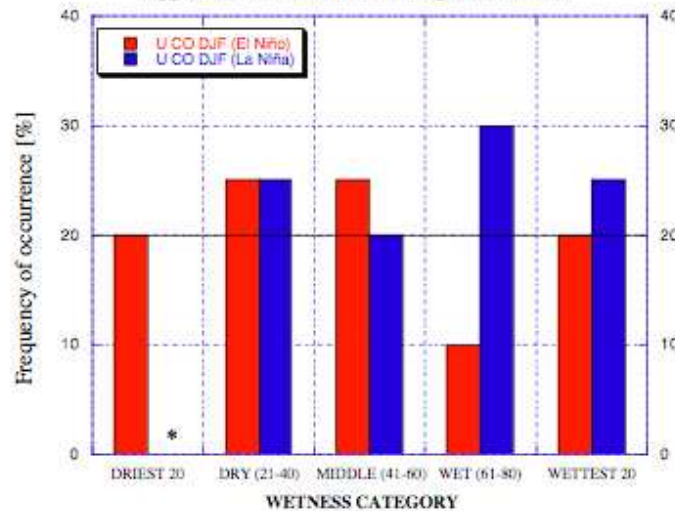
Winter (left)

VS.

Spring (right)

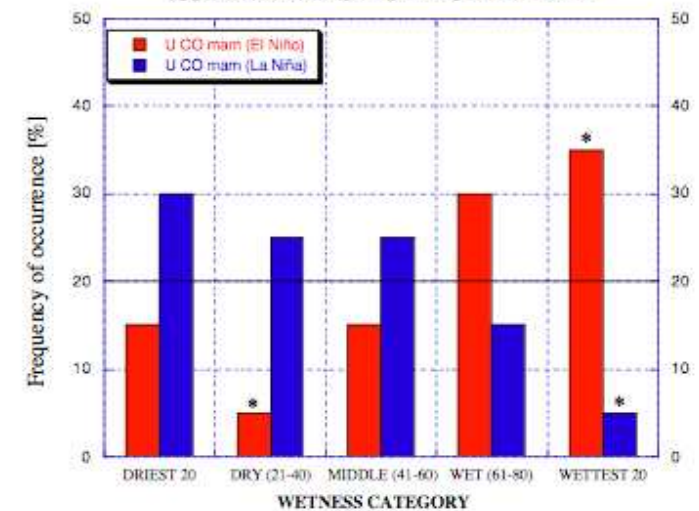
Lower Basin

Upper Colorado Winter Precip (1896-1995)



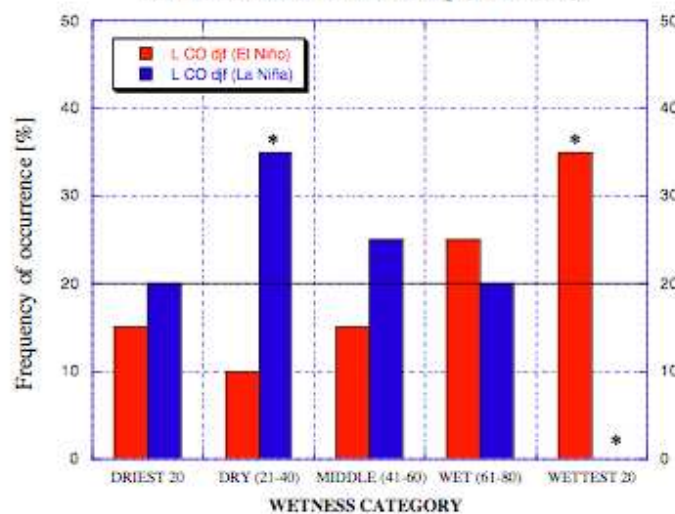
Source: U.S. Climate Division data in comparison with the winter-time Tahiti-Darwin SOI (analysis by Klaus Wolter, Climate Diagnostics Center)

Upper Colorado Spring Precip (1896-1995)



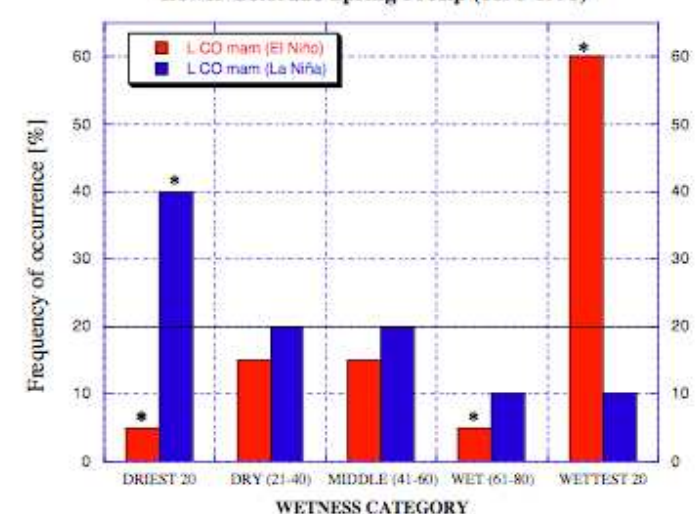
Source: U.S. Climate Division data in comparison with the winter-time Tahiti-Darwin SOI (analysis by Klaus Wolter, Climate Diagnostics Center)

Lower Colorado Winter Precip (1896-1995)



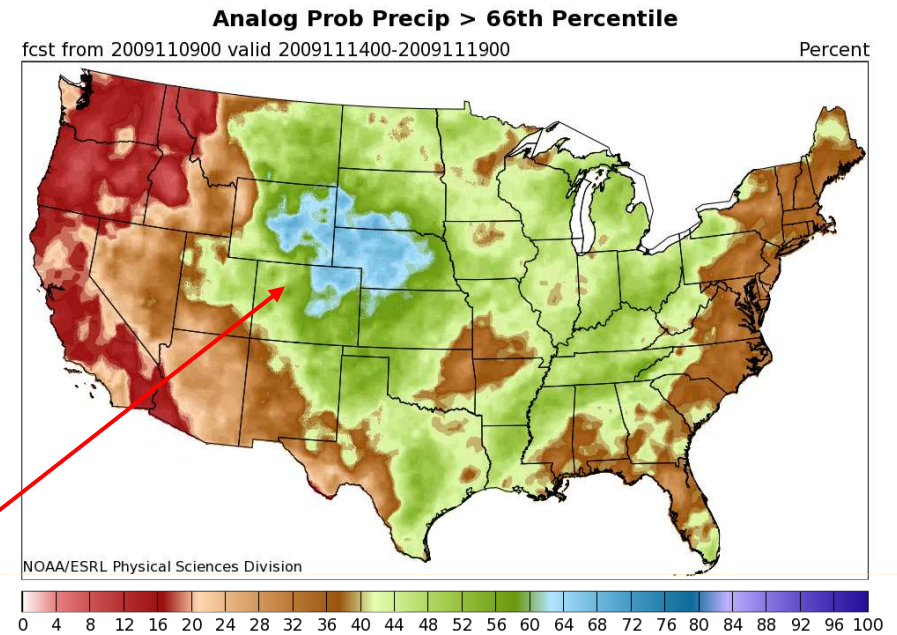
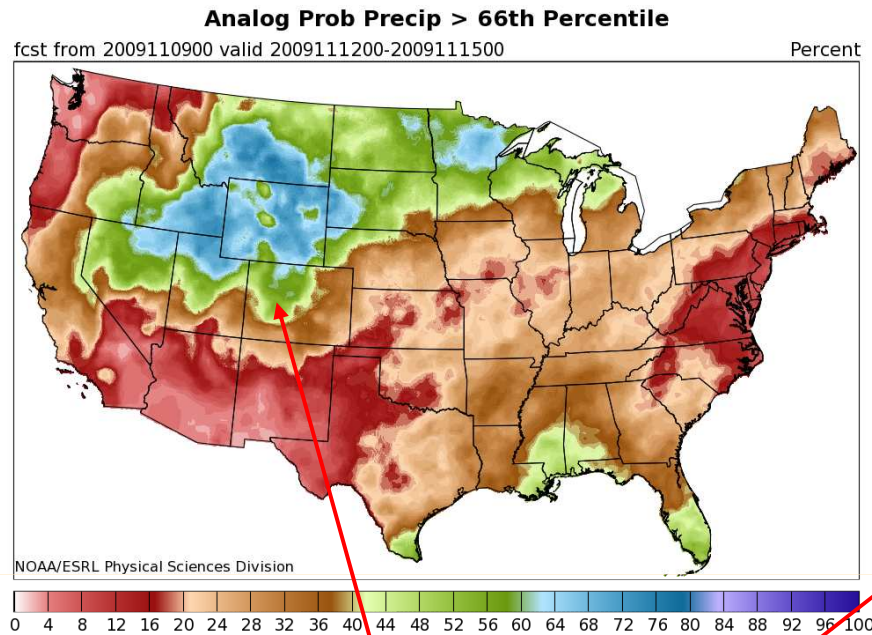
Source: U.S. Climate Division data in comparison with the winter-time Tahiti-Darwin SOI (analysis by Klaus Wolter, Climate Diagnostics Center)

Lower Colorado Spring Precip (1896-1995)

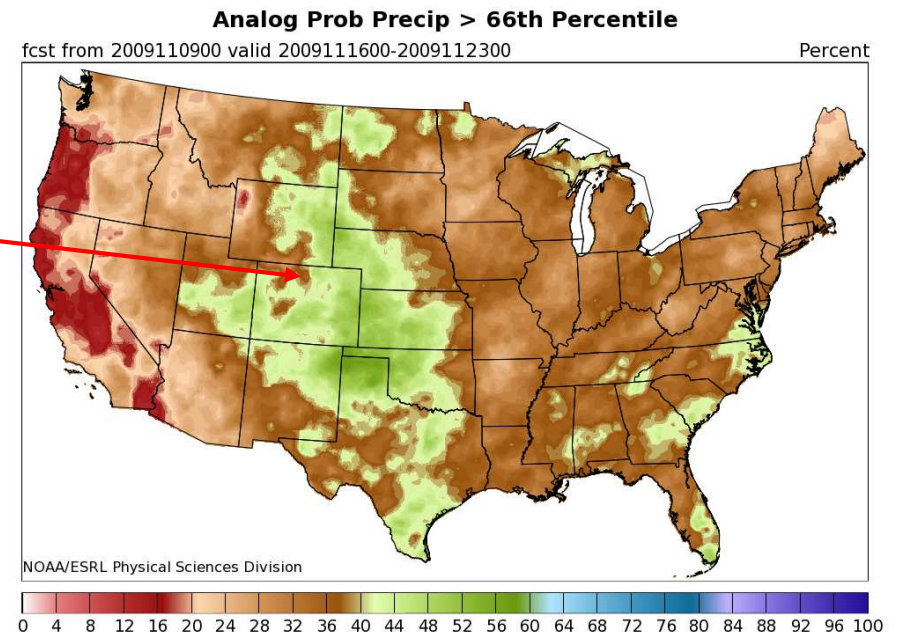


Source: U.S. Climate Division data in comparison with the winter-time Tahiti-Darwin SOI (analysis by Klaus Wolter, Climate Diagnostics Center)

What can we expect in the next two weeks?

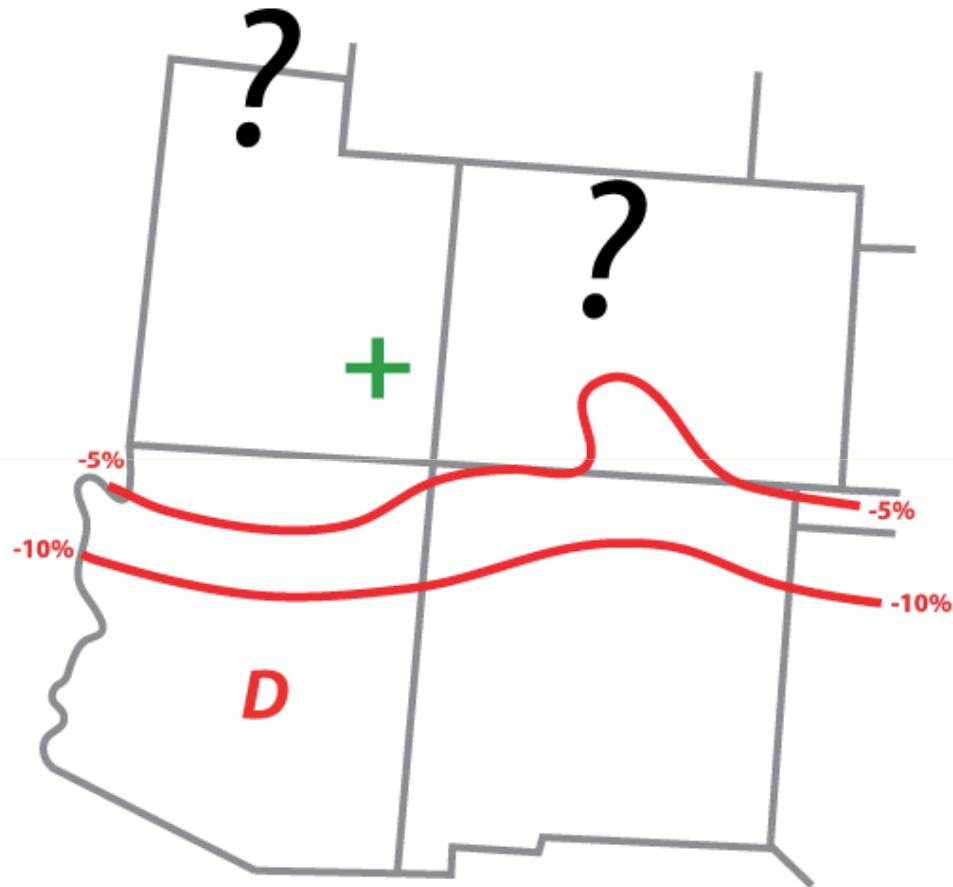


Rainfall chances for 4-6, 6-10, and 8-14 days from yesterday show a good chance for moisture later this week for the Upper Colorado basin, followed by a drying trend later next week. We should also return to near-normal temperatures for mid-November.



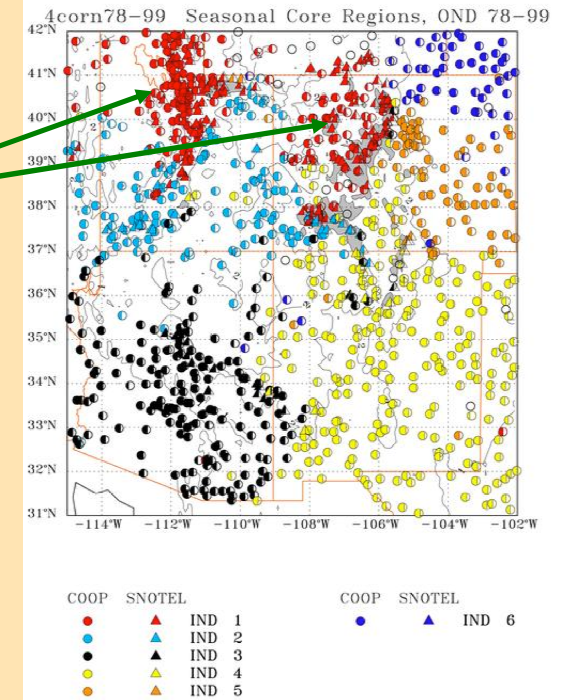
SWcasts

EXPERIMENTAL PSD PRECIPITATION FORECAST GUIDANCE
OCT - DEC 2009 (issued September 16, 2009)

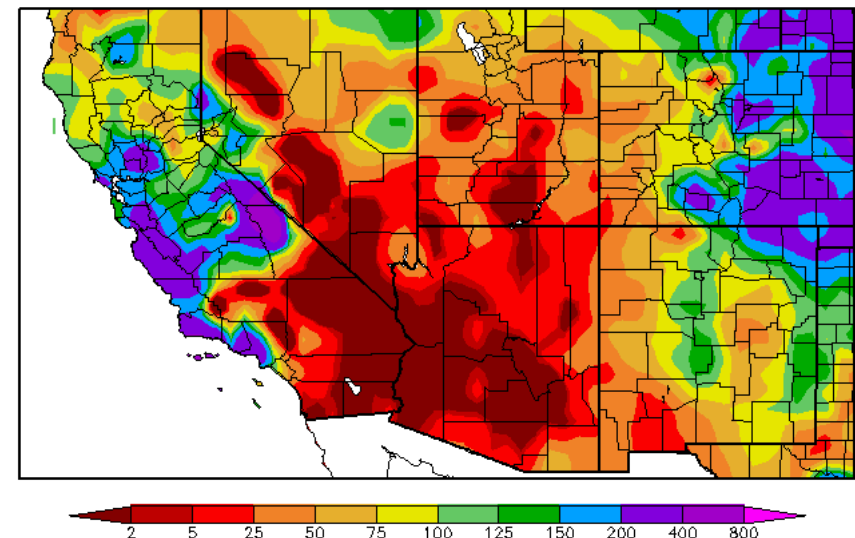


A surprisingly dry forecast for AZ/NM has been verifying so far...

This region and season correlates at +0.7 with subsequent runoff at Lees Ferry!



Percent of Normal Precipitation (%)
10/1/2009 - 11/8/2009

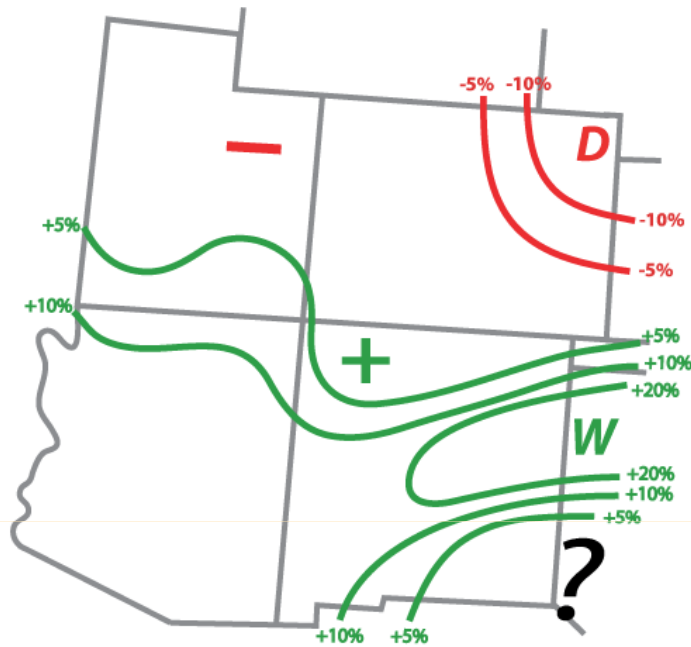


Generated 11/9/2009 at HPRCC using provisional data.

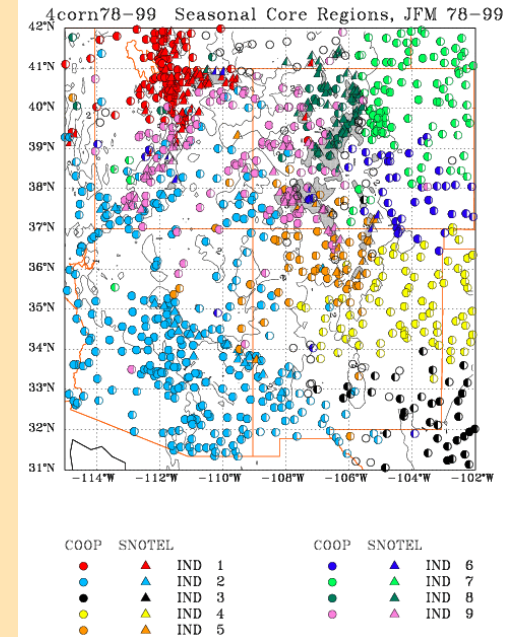
NOAA Regional Climate Centers

SWcasts

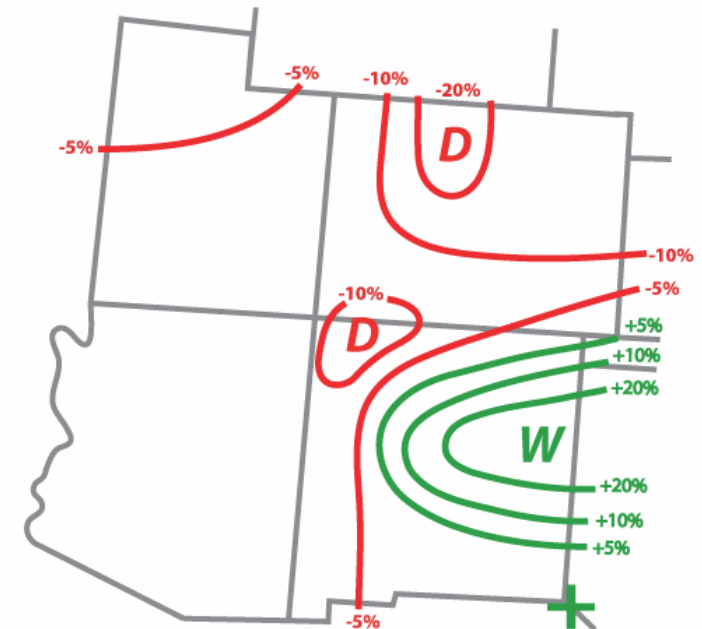
EXPERIMENTAL PSD PRECIPITATION FORECAST GUIDANCE
JAN - MAR 2010 (issued September 29, 2009)



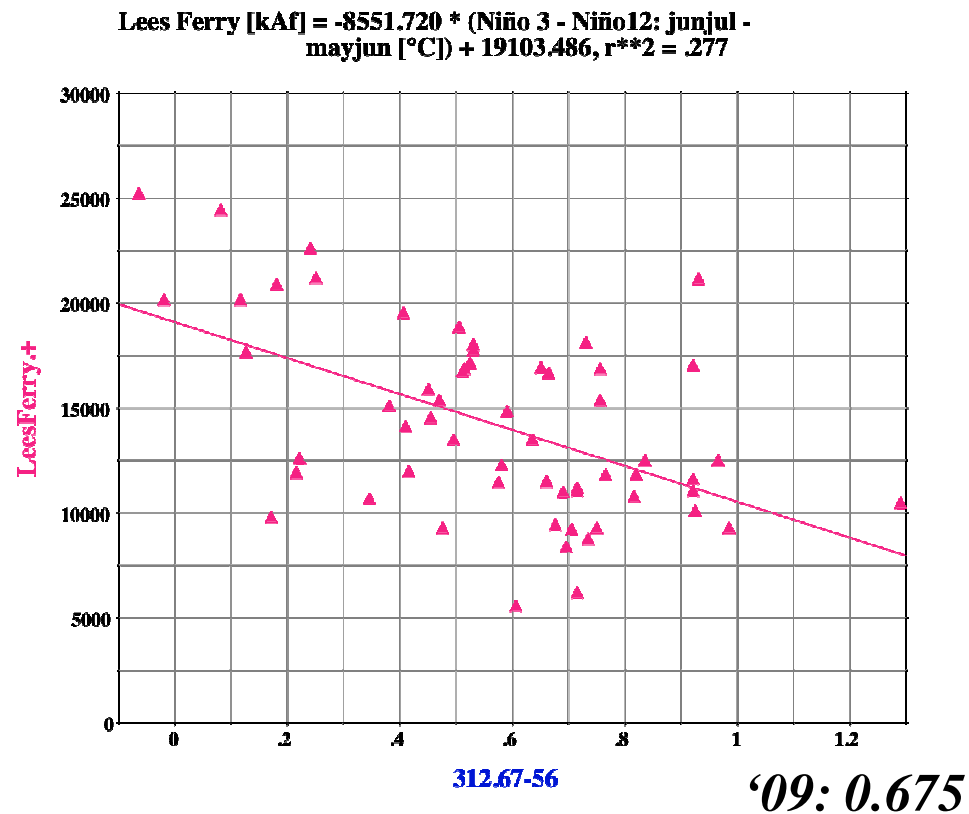
My September forecast (top) for late winter (Jan-Mar '10) was fairly consistent with El Niño expectations, while the more recent updates (right) have been much less optimistic for Arizona and Colorado's mountains in particular. *Historical skill during the last decade has been better for earlier forecasts!*



EXPERIMENTAL PSD PRECIPITATION FORECAST GUIDANCE
JAN - MAR 2010 (issued November 6, 2009)



A first attempt at predicting Lees Ferry runoff in 2010



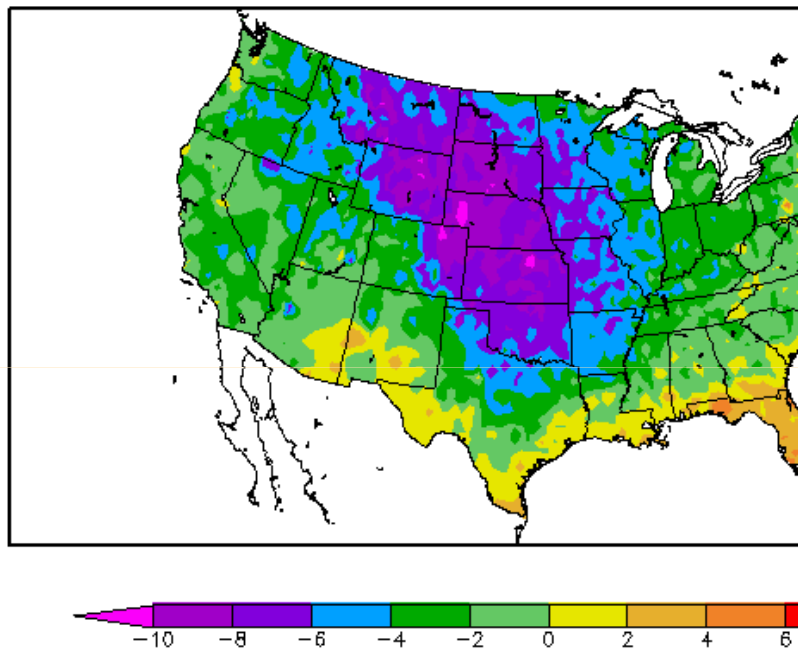
Best predictor at this lead-time is tendency of east Pacific Niño SST gradient over the early summer – anticipates a slight deficit (about -7%) for next year's flow.

Executive Summary

- Next two weeks don't look particularly active for the southwestern U.S., with one mid-sized storm system crossing our region later this week, but not much behind that until possibly later next week.
- Current classification of growing El Niño / neutral PDO gives most of Utah and Colorado better than average precipitation chances through November, but decreased chances for moisture in the core winter months, followed by improved chances for late season precipitation in spring. If this El Niño were to strengthen further, this would increase precipitation chances in spring, but would not necessarily help during the winter season.
- Given this sequence of typical El Niño impacts, it will be of interest to monitor both ENSO status and snowpack as we get into the winter – the lower the snowpack gets in the winter (as percent of normal), the harder it will be to recover from this deficit, ditto for ENSO (weak winter El Niño has lower chances for spring-time pay-off).
- A first attempt at predicting Lees Ferry runoff based on information through October yields a below-average 'forecast' (around 13.5 M Af).

Unusual October Cold in NE Colorado -> ?

Departure from Normal Temperature (F)
10/1/2009 - 10/31/2009



Generated 11/1/2009 at HPRCC using provisional data.

Composite Standardized Precipitation Anomalies
Versus 1950-1995 Longterm Average
Nov to Apr 1911-12, 1913-14, 1919-20, 1923-24, 1925-26, 1969-70, 1970-71, 1984-85
2002-03,

